

CLAIMS:

1. A framed panel unit comprising a panel;

a plurality of thermoplastic frame members disposed along the edge of said panel;

5 each frame member having first and second opposed side walls defining a channel therebetween, the edge of said panel being received within the channel of each frame member;

the channel of each frame member having spacer  
10 means therein including a first spacer between said panel and said first side wall for spacing said panel from said first side wall and a second spacer between said panel and said second side wall for spacing said panel from said second side wall and where prior to welding together the  
15 ends of said frame members, said spacer means retain said frame members on said panel.

2. A panel unit as claimed in claim 1, wherein at least one of said first and second spacers includes a protrusion extending therefrom and engaging a respective  
20 side of said panel for resiliently retaining said frame member on said panel.

3. A panel unit as claimed in claim 1 or 2, wherein said channel of each frame member includes a base between the first and second opposed sidewalls, and each spacer  
25 means further comprises a third spacer arranged between the edge of said panel and the base of said channel.

4. A panel unit as claimed in claim 3, wherein said first and second spacers are coupled to said third spacer.

5. A panel unit as claimed in claim 4, wherein for each spacer means, the first and second spacers are hingedly coupled to said third spacer and the respective junction between each of said first and second spacers and said third  
5 spacer includes a recess to accommodate folding of said first and second spacers relative to said third spacer.

6. A framed panel unit as claimed in claim 4, wherein said third spacer includes locator means for positioning said third spacer at a predetermined lateral position  
10 between the side walls of said channel.

7. A framed panel unit as claimed in claim 6, wherein the base of said channel has first and second oppositely sloped upper surfaces which slope transversely of said channel and said locator means includes first and second  
15 oppositely sloped lower surfaces of said third spacer which engage the sloped surfaces of said channel such that said third spacer is urged towards a central position within said channel on applying a force to said third spacer towards the base of said channel.

20 8. A framed panel unit as claimed in any one of claims 3 to 7, wherein said third spacer includes means for permitting fluid to flow therethrough between adjacent portions of said channel separated by said third spacer.

9. A framed panel unit as claimed in any preceding  
25 claim, wherein each frame member comprises polyvinyl chloride (PVC) thermoplastic material.

10. A framed panel unit as claimed in any preceding claim further comprising a weldable flange member disposed between and welded to adjacent ends of said frame members.

11. A framed panel unit as claimed in any preceding claim, wherein said panel is comprising at least part of sheet glass.

12. A framed panel unit as claimed in claim 11,  
5 wherein said panel comprises one of a single sheet of glass, a double glazed insulating glass unit, a triple glazed insulating glass unit, and a centre lite of a triple glazed unit.

13. A panel unit as claimed in any preceding claim,  
10 wherein at least one of said first and second spacers is positioned below the top of a respective channel wall to provide an open gap at the top of said side wall for receiving sealant.

14. A framed panel unit as claimed in claim 13,  
15 wherein said sealant material comprises a reactive sealant material.

15. A framed panel unit as claimed in claim 14, wherein the open time of said reactive sealant is two seconds or less.

20 16. A framed panel unit as claimed in claim 14 or 15, wherein said reactive sealant is one of polyurethane based and silicone based.

17. A framed panel unit as claimed in any one of claims 13 to 16, wherein said sealant material has a high  
25 modulus.

18. A framed panel as claimed in any one of claims 1 to 4, wherein at least one of said first and second spacers is integrally formed with a respective channel wall.

19. A panel unit comprising first and second opposed sheet members;

a spacer between said sheet members spacing said sheet members apart, said spacer comprising at least in part thermoplastic sealant material and being located proximate an edge of the sheet members;

a frame member having a channel formed therein, said edge being disposed within said channel;

a means of centering said panel unit within said channel; and

a reactive thermoplastic sealant material bonding said sheets to said frame member.

20. A panel unit as claimed in claim 19, wherein said frame member has opposed side walls defining said channel therebetween, and said reactive thermoplastic sealant material is disposed between an outer facing surface of at least one of said sheets and a side wall of said frame member.

21. A panel unit as claimed in claim 20, wherein said reactive thermoplastic sealant material is disposed between the outer surface of each sheet member and a respective channel side wall adjacent thereto.

22. A panel unit as claimed in claim 19, 20 or 21, wherein said thermoplastic spacer is the perimeter edge seal and the only spacer spacing said sheet members apart.

23. A panel unit as claimed in any of claims 19 to 22, wherein said frame member has opposed side walls defining said channel therebetween and a space is defined between an

outer face of a sheet member and an adjacent side wall, and said reactive thermoplastic sealant material is disposed within said space.

24. A panel unit as claimed in claim 23, wherein the side walls of said channel are spaced apart by a distance which is greater than the distance between opposed outer faces of said first and second sheet members and said first and second sheet members are arranged within said channel to define a space between each channel side wall and a respective adjacent outer face, and said reactive thermoplastic sealant material is disposed within each space.

25. A panel unit as claimed in any of claims 19 to 24, wherein said spacer comprises butyl sealant, polyisobutylene sealant or a sealant comprising a combination of butyl and polyisobutylene.

26. A panel unit as claimed in any of claims 19 to 25, wherein said reactive thermoplastic sealant material includes one of polyurethane and silicone.

27. A panel unit as claimed in any of claims 19 to 26, wherein the open time of said reactive thermoplastic sealant material is about two seconds or less.

28. A panel unit as claimed in any of claims 19 to 27, wherein said spacer is positioned adjacent an edge of said sheets.

29. A panel unit as claimed in any of claims 19 to 28, wherein said frame member has opposed side walls defining said channel therebetween, and further including a pre-formed insert between a channel side wall and an outer face of a sheet member for spacing said outer face of said sheet

member from said side wall to define a gap therebetween for said reactive bonding material.

30. A panel unit as claimed in any of claims 19 to 28 wherein said frame member has opposed side walls defining  
5 said channel therebetween, and further comprising a pre-formed spacer insert inserted into said channel, said insert including a spacer between the outer face of each sheet member and a respective adjacent channel side wall to define a gap between a respective outer face and side wall for  
10 receiving said reactive bonding material.

31. A panel unit as claimed in claim 30, wherein said insert is slidable along said channel.

32. A panel unit as claimed in claim 30 or 31, wherein said insert comprises a resilient rubber material and said  
15 panel unit includes friction reducing means between said insert and said channel to facilitate relative movement between said insert and said frame member.

33. A panel unit as claimed in any of claims 19 to 32 wherein at least one of said first and second sheet members  
20 comprises one of glass, acrylic, polycarbonate and other plastic material.

34. A panel unit as claimed in claim 30 or 31 comprising a plurality of said spacer means spaced apart along said channel.

25 35. A panel unit as claimed in any one of claims 19 to 28, wherein said frame member has opposed sidewalls defining said channel therebetween, and spacer means arranged to engage opposed outer faces of said sheet members, and wherein said spacer means includes one or more protrusions

integrally formed with and extending from a sidewall of said channel.

36. A panel unit as claimed in claim 35, wherein said spacer means includes one or more protrusion integrally  
5 formed with and extending from the other sidewall.

37. A panel unit of claims 35 or 36 where said integrally formed protrusions comprise flexible plastic fins.

38. A panel unit of claim 37 where said integrally  
10 formed protrusions further comprise a flexible bulb seal located at the top of one of said sidewalls.

39. A method of forming a framed panel, comprising the steps of:

(a) providing a panel to be framed;

15 (b) providing a plurality of frame members for framing said panel, each frame member having a channel formed therein for receiving an edge portion of said panel and resilient means within said channel for spacing the panel from opposed side walls of said channel and for resiliently retaining said  
20 panel in said channel;

(c) inserting said panel into the channel of each frame member such that said frame members are held on said panel by said resilient means; and

(d) joining the ends of adjacent frame members together by  
25 welding.

40. A method as claimed in claim 39, wherein the step of joining comprises forming a plurality of welded joints using a separate welding station for each joint.

41. A method as claimed in claim 40, wherein the step of joining comprises forming said plurality of welded joints substantially simultaneously.

42. A method as claimed in any of claims 39 to 41,  
5 wherein the step of joining comprises

(e) positioning a weldable member between adjacent ends of two frame members; and

(f) welding each end to said weldable member by urging said frame members into engagement with said weldable member, and  
10 vibrating said weldable member to cause melting of material at the interface of each end and said weldable member.

43. A method as claimed in claim 42 further comprising performing steps (e) and (f) for each joint.

44. A method as claimed in claim 43 comprising  
15 performing steps (e) and (f) for each joint substantially simultaneously.

45. A method as claimed in any of claims 42 to 44 where the framing members are interconnected by junction pieces prior to transferring the assembled frame and panel  
20 components to the welding apparatus.

46. A method of claim 45 where said junction piece incorporates integral legs.

47. A method as claimed in any of claims 39 to 44, comprising permitting said panel to move relative to each  
25 frame member for at least part of said joining step.

48. A method as claimed in claim 47, wherein said permitting includes permitting said panel to move in a



direction along the channel of each frame member during at least part of said joining step.

49. A method as claimed in claim 47 or 48, wherein permitting movement comprises permitting movement of said resilient means relative to said channel.

50. A method as claimed in any of claims 41 to 49, wherein the step of providing a panel comprises providing a panel comprising first and second opposed sheet members and a thermoplastic sealant spacer between said sheet members spacing said sheet members apart, wherein said thermoplastic sealant spacer is the only spacer spacing said sheet members apart.

51. A method as claimed in claim 50, wherein the step of providing said panel comprises the steps of providing said first and second sheet members, forming said thermoplastic spacer and joining said first and second sheet members with said thermoplastic sealant spacer therebetween.

52. A method as claimed in any of claims 39 to 51, further comprising the step of applying a reactive thermoplastic sealant material between said panel and at least a portion of a frame member.

53. A method as claimed in claim 52, wherein said reactive thermoplastic sealant material is applied after said joining step.

54. A method as claimed in any of claims 39 to 53, further comprising the step of applying a reactive thermoplastic sealant material for bonding the frame members to the panel to both outwardly facing surfaces of said panel substantially simultaneously.

55. A method as claimed in any of claims 39 to 54, comprising applying a reactive thermoplastic sealant material for bonding between said panel and said frame members after said joining step and when said panel is in a substantially upright position.

56. A frame member for a panel, comprising first and second opposed side walls defining a channel therebetween for receiving said panel;

first and second pre-formed spacers comprising a resilient material inserted in said channel;

the first spacer being positioned against said first side wall for spacing one side of said panel therefrom and said second spacer being positioned against said second side wall to space the other side of said panel therefrom.

57. A frame member as claimed in claim 56, wherein said first and second spacers are mounted in said channel such that said spacers are capable of sliding along said channel.

58. A frame member as claimed in claim 56 or 57 further comprising retaining means for retaining at least one of said first and second spacers in said channel to limit movement of said spacers in a direction transverse to the length of said channel towards the channel opening defined between said opposed side walls.

59. A frame member as claimed in claim 58, wherein said retaining means is arranged to permit movement of said spacers in a direction along said channel.

60. A frame member as claimed in claim 58 or 59, wherein said retaining means for a respective spacer

comprises a protrusion extending from a channel side wall into said channel.

61. A frame member as claimed in any of claims 56 to 60, wherein at least one surface of the channel which  
5 engages a spacer and the surface of said spacer which engages said channel is a low friction surface.

62. A frame member as claimed in claim 56, wherein at least one of said first and second spacers has a respective protrusion extending therefrom for engaging a side of said  
10 panel.

63. A frame member as claimed in claim 62, wherein a respective protrusion extending from a spacer has an upper surface and a lower surface and is arranged to be deflected towards the base of the channel on insertion of the panel in  
15 said frame member such that the upper surface of said protrusion engages said panel to retain said panel in said frame member.

64. A frame member as claimed in claim 62 or 63, wherein the upper surface of the protrusion is angled  
20 towards the base of said channel prior to deflection by said panel.

65. A frame member as claimed in any of claims 56 to 64, comprising a third spacer positioned at the base of said channel for spacing said panel from said base.

25 66. A frame member as claimed in claim 65, wherein said third spacer is coupled to at least one of said first and second spacers.

67. A frame member as claimed in claim 66, wherein said third spacer is hingedly coupled to at least one of said first and second spacers.

68. A frame member as claimed in claim 67 wherein the  
5 third spacer has first and second side edges and each of said first and second spacers has a lower edge, and at least one of said first and second spacers is hingedly coupled to the third spacer along and between respective adjacent edges.

10 69. A frame member as claimed in claim 70 including biasing means between said third spacer and at least one of said first and second spacers for urging a respective spacer outwardly into engagement with a respective channel wall.

70. A frame member as claimed in claim 69 wherein said  
15 third spacer has a lower surface which engages the base of said channel and said third spacer includes a formation on its lower surface, and the base of said channel includes a complementary formation to locate said third spacer at a predetermined position between the side walls of said  
20 channel when said formations engage.

71. A frame member as claimed in claim 70 wherein said  
third spacer includes oppositely sloped lower surfaces providing said formation and the base of said channel includes complementary oppositely sloped surfaces for  
25 engaging said formation.

72. A frame member as claimed in claim 71, wherein the sloped surfaces of said third member slope downwards towards a centre line through said third spacer between opposed sides thereof, and complementary surfaces of the base of

said channel slope downwards towards the centre of said channel.

73. A frame member as claimed in claim 72, wherein said third spacer includes means formed therein which allows fluid communication therethrough in a direction along said channel.

74. A spacer for use in mounting a panel within a channel of a frame member, comprising a base portion for spacing said panel from the base of said channel;

10 a side portion extending from said base portion for spacing said panel from a side wall of said channel; and

a protrusion extending from said side portion for engaging a face of said panel and for resiliently retaining said panel in said frame member.

15 75. A spacer as claimed in claim 74, wherein said protrusion extends from an upper end of said side portion.

76. A spacer as claimed in claim 74 or 75, wherein the side portion includes a recess below said protrusion to allow said protrusion to flex toward said base portion.

20 77. A spacer as claimed in any of claims 74 to 76, wherein said protrusion has an upper surface which is directed towards said base portion when said protrusion is in an unstressed condition.

78. A spacer as claimed in any of claims 74 to 77, wherein said protrusion is formed by an extension of said side portion which is folded such that said protrusion extends from said side portion.

79. A spacer as claimed in any of claims 74 to 78 wherein said side portion is hingedly coupled to said base portion.

80. A spacer as claimed in claim 79, wherein said side  
5 portion is integrally formed with said base portion and the junction between said base portion and said side portion has a reduced thickness to hingedly couple said portions together.

81. A spacer as claimed in claim 80, wherein a region  
10 adjacent said junction of at least one of said base portion and said side portion is relieved to accommodate folding of said side portion towards said base portion.

82. A spacer as claimed in any of claims 74 to 81, further comprising a second side portion extending from said  
15 base portion for spacing said panel from an opposite side wall of said channel, and including a protrusion extending from said second side portion for engaging an opposite face of said panel and for resiliently retaining said panel in said frame member with said first protrusion.

20 83. A spacer as claimed in claim 82, wherein said second side portion is hingedly coupled to said base portion.

84. A spacer as claimed in any of claims 74 to 83 wherein the surface of the spacer which engages said channel  
25 includes means for positioning said spacer within said channel at a predetermined transverse position.

85. A spacer as claimed in claim 84, wherein said positioning means comprises oppositely sloped lower surfaces of said base portion.

86. A spacer as claimed in claim 85, wherein said oppositely sloped surfaces slope downwards towards an axial centre line through said base portion.

87. A spacer as claimed in any of claims 74 to 86  
5 wherein said base portion includes means for permitting fluid to flow therethrough between adjacent portions of the channel separated by said spacer when inserted in said channel.

88. A spacer as claimed in any of claims 74 to 87,  
10 wherein the outer surfaces thereof are low friction surfaces.

89. A spacer as claimed in claim 88, including a low friction layer or coating for providing said low friction surfaces.

90. A spacer as claimed in any of claims 74 to 89,  
15 wherein the surface of said protrusion for engaging said panel is a relatively high friction surface.

91. A spacer as claimed in any of claims 74 to 90  
20 where said spacer is made from ethylene propylene diene monomer (EPDM) rubber.

92. A frame member comprising first and second opposed sidewalls defining a channel therebetween, at least one sidewall having an elongate recess formed therein extending along the channel and positioned below the top of a  
25 respective sidewall.

93. A frame member as claimed in claim 92, wherein the upper edge of said recess is substantially perpendicular or angled downwardly from the recess towards said channel with

respect to a line directed from the base to the top of said channel.

94. A frame member as claimed in any of claims '92 or 93, wherein said channel includes a base having oppositely  
5 sloped upper surfaces transverse to said channel.



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